Evaluation of complete blood count parameters in patient with acute myocardial infarction over 80 years of age and under 40 years of age

Elderly, complete blood count, acute myocardial infarction

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Abstract

Aim: In our study, we compared the values of whole blood count (CBC) parameters, neutrophil-lymphocyte ratio (NLR) and platelet-lymphocyte ratio (PLR) parameters of patients over 80 years and under 40 years of age with acute myocardial infarction (AMI). Material and Method: We performed a retrospective study between 2011 and 2016 by screening the files of AMI patients who underwent primary percutaneous coronary intervention. A total of 259 patients under 40 years of age (Group 1) and over 80 years of age (Group 2) were included in the study. Results: When the hematological parameters were examined, white blood cell (WBC), neutrophil, lymphocyte, thrombocyte, hemoglobin, hematocrit numbers were found to be significantly higher in Group 1 patients. When PLR and NLR were examined (105.8 ± 67.6 & 149.2 ± 94; p <0.001, 3.2 ± 3.2 & 4.2 ± 4.4, p < 0.074 respectively), PLR was significantly higher in group 1. When the age was correlated with hematological and biochemical parameters, there was a significant negative correlation with WBC, neutrophil, lymphocyte, and platelet, was and a positive correlation with PLR, NLR, red blood cell distribution width (RDW), Gensini score and creatinine. Discussion: In elderly patients over 80 years, the hematological response of cells to acute events such as AMI was reduced due to the decreased bone marrow function.

Keywords

Acute Myocardial Infarction; Complete Blood Count; Elderly

Introduction

Coronary artery disease (CAD) is a progressive inflammatory disease which is still the leading cause of morbidity and mortality worldwide. Atherosclerosis plays an important role in the pathogenesis of CAD [1]. Furthermore, atherosclerosis plays an important role in plaque rupture and thrombus formation, especially in acute coronary syndromes [2,3]. Platelets and leukocytes play a very important role in this process [4-6].

Complete blood count (CBC) is one of the most common laboratory tests in clinical practice. Automated cell counters routinely measure white blood cell count (WBC), neutrophil, lymphocyte, platelet count (PLT) and mean platelet volume (MPV), red blood cell distribution width (RDW). Both these values and values such as neutrophil-lymphocyte ratio (NLR) and platelet-lymphocyte ratio (PLR) have been used in previous studies as an inflammatory marker in many diseases.

The world is getting older and the ratio of elderly people in developing countries is rapidly increasing. Previous studies do not compare age groups. However, we compared the values of CBC parameters, NLO > NLR, PLO>PLR in patients with acute myocardial infarction above 80 years of age and under 40 years of age in our study, and examined the responses of patients in these groups.

Material and Method

The study was planned retrospectively and data were obtained between 2011 and 2016 by screening the files of patients with acute myocardial infarction who underwent primary percutaneous coronary intervention. The required approval was obtained from the local ethics committee for non-drug clinical investigations in the study.

A total of 259 patients under 40 years old and over 80 years old who were treated with acute coronary syndrome (ST-segment elevation myocardial infarction (STEMI)) were included in the study. ACS (acute coronary sydrome) was defined as having a chest pain associated with myocardial ischemia with electrocardiographic changes and/or elevated cardiac markers. STEMI was defined as having a ST-segment elevation of ≥1 mm in two adjacent leads according to the ACC / ESC criteria and a high troponin value.

Exclusion Criteria: Patients with a history of clinically active infection, thyroid dysfunction, clinically active malignancy, hematologic proliferative disease, active or chronic autoimmune disease, taking steroid or chemotherapy, recent trauma or surgical history were excluded.

Statistical Analysis

SPSS for Windows version 15.0 software (SPSS Inc., Chicago, IL, USA) was used for statistical analysis. All continuous variables were expressed as mean ± SD, and categorical variables were defined as numbers and percentages. In addition, categorical data were compared using a chi-square test, and continuous variables were compared between the groups using Student t-test or the Mann–Whitney U test, depending on whether they were distributed normally, which was determined with the Shapiro–Wilk test. Finally, Pearson and Spearman correlation analyses were used to estimate the relationship between the test parameters, and p-value of < 0.05 was considered to be statistically significant.

Results

A total of 259 patients who had undergone AMI (acute myocardial infarction) between the years 2011 and 2016 were enrolled in our study. Eighty-five of these patients were below 40 years old (Group 1). Group 2 consisted of 174 patients over 80 years old. The mean age of participants in Group 1 was 35 years, 83 years in Group 2 and in Group 1 there were more male patients than in Group 2 (p <0.001) (Table 1). The creatinine and HDL values in Group 2 patients were significantly higher than in Group 1, but triglyceride levels were lower than in Group 1 (p <0.001) (Table 1). There was no significant difference between the other biochemical markers in the groups. Gensini score was significantly higher in Group 2 (p <0.001) (Table 1).

The results of hematological parameters were significantly different between the groups. Especially, WBC, neutrophil, lymphocyte, thrombocyte, hemoglobin, hematocrit values are higher than in Group 2 (Table 2). When PLR and NLR were examined (105.8 ± 67.6 & 149.2 ± 94; p <0.001, 3.2 ± 3.2 & 4.2 ± 4.4; p <0.074 respectively), PLR was significantly higher in Group 1 (Table 2).

Table 1. Demographic and clinical characteristics of patients

Variable	GROUP 1 (n=85)	GROUP 2 (n=174)	P value
Age, years	35.3 ± 2.9	83.5 ± 2.2	0.001
Gender, male/female	80/5	98/76	0.001
Urea	13 ± 3.5	23 ± 9	0.001
Creatinin	0.9 ± 0.18	1.2± 0.62	0.001
Glucose	135 ± 58	149 ± 78	0.264
AST	54 ± 91	41 ± 52	0.292
ALT	37 ± 29	22 ± 20	0.001
LDL	111 ± 44	101 ± 37	0.187
HDL	36 ± 9	46 ± 12	0,001
Triglyceride	197 ± 168	124 ± 64	0.001
Total Cholesterol	183 ± 50	170 ±46	0.146
Troponin	0.53 ± 1.1	0.47 ± 1.3	0.695
CK-MB	43 ± 70	30 ± 47	0.088
GENSINI	44.5 ± 12.8	67.8 ± 13.4	0.001

Table 2. Hematological Parameters

Variables	GRUP 1 (n=85)	GRUP 2 (n=174)	P Değeri
WBC	11252 ± 2973	8891 ±3389	0.001
Hemoglobin	14.8 ± 1.3	12.3 ± 1.5	0.001
Hematocrit	42.3 ± 3.7	36.4 ± 4.1	0.001
Platelet	256388 ± 59351	229225 ±74875	0.004
Neutrophil	7229 ± 3144	6064 ± 3180	0.006
Lymphocytes	2938 ± 1156	1870 ± 890	0.001
Monocytes	826 ± 287	763 ± 328	0.13
MPW	9.9 ± 0.9	10.1 ± 0.9	0.2
RDW	13.8 ± 1.3	14.4 ± 1.6	0.003
NLR	3.2 ± 3.2	4.2 ± 4.4	0.074
PLR	105.8 ± 67.6	149.2 ± 94	0.001

WBC: white blood cell count ,MPW: mean platelet volume, RDW: red blood cell distribution width, NLR: Neutrophil / Lymphocytes ratio , PLR: Platelet/ Lymphocytes ratio

When the age was correlated with hematological and biochemical parameters, there was a significant positive correlation with WBC, neutrophil, lymphocyte, platelet, PLR, NLR, RDW, Gensini score and creatinine (Table 3).

Table 3. Correlation of Age and Other Parameters

Age	r value	P value
Creatinin	0.256	0.001
WBC	-0.313	0.001
Neutrophil	-0.159	0.01
Lymphocytes	-0.456	0.001
Platelet	-0.176	0.005
RDW	0.181	0.004
PLR	0.235	0.001
NLR	0.123	0.048
Gensini Score	0.642	0.001

WBC: white blood cell count, RDW: red blood cell distribution width, NLR: Neutrophil / Lymphocytes ratio , PLR: Platelet/ Lymphocytes ratio

Discussion

In our study, changes in hematologic parameters after AMI in patients over 80 years of age were significantly different when compared with patients under 40 years of age. Especially, MDR>WBC, neutrophil, lymphocyte, platelet counts were rarely seen in patients over 80 years of age. PLR and NLR, on the other hand, were found to be in excess.

Previous studies have shown that WBC increases during AMI and isa predictor of mortality in STEMI and NSTEMI patients [7,8]. Not only WBC, lymphocytes, and platelets have also been implicated in this process, thus they have different values in the CBC [9]. Numerous studies have been published on whether all these CBC values are predictors of cardiovascular morbidity and mortality [10-13]. In our work, we did not work with normal individuals because we have already proved the comparison.

In our study, it is possible that bone marrow and lymphoid tissue function decrease with aging, especially in patients over 80 years of age due to less change in hematologic parameters. As a result, anemia or coagulation problems can also occur in elderly people. Apart from the problems in the production of the cells, the autoimmune diseases are seen more frequently in this group because the antibody response decreases and the auto antibody response increases. All of these can cause anemia, infection, and delay in wound healing. In this process, changes in biochemical structure of tissues decreased physiological capacity of organs, increased sensitivity to internal and external factors [14].

Although it is possible to explain the hematological differences between the groups as a physiological process, PLR and NLR values were different among the groups and higher in elderly patients. Both PLR and NLR have been demonstrated in previous studies in which STEMI is a predictor of mortality in percutaneous interventions [15-17]. PLR and NLR values may also be high in this Group 2 because the Gensini score in our study is high in the elderly patients.

Study Limitations

Our study was a single-center study that included relatively small number of patients. Being retrospective, this study has limitations due to the incomplete data in some patients admitted to hospital for cardiac causes. Furthermore, extensive studies with a large patient cohort are warranted in the future to overcome these limitations.

Conclusion

In elderly patients over 80 years, the hematological response of cells to acute events such as AMI was reduced because of the decreased bone marrow function. As a result, acute events in elderly people can be experienced more seriously. The increase in PLR and NLR may be due to the greater prevalence and severity of coronary vascular disease in elderly people.

Scientific Responsibility Statement
The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement
All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

Conflict of interest
None of the authors received any type of financial support that could be considered potential conflict of interest regarding the manuscript or its submission.

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